Europa – Narrow Roads, Fast Track

By Paolo Velcich, Industrial Designer, Korum Design

It was a crazy schedule from the start

Sora's goal was to have a new line of mid-sized tour buses ready in time for the annual trade show in Verona. Designed for operating on the tight mountain roads of the Italian Riviera, smaller buses also appeal to European tour operators since many cities no longer allow large buses in the city center.

After much discussion during January and February 1998, the decision to develop the new buses was finally made. A development team was formed and tasks assigned. That left us only **six months** for the entire design and development process, including the August vacation (yes, everything stops in Italy during August).

Since I knew the first models would be based on MAN 8.0- and 9.0-meter frames, I started working on some ideas in **Rhino**. But the rest of the team didn't start until April, when the SDRC I-DEAS systems were added to the two existing AutoCAD drafting seats.

By the end of April, my first preliminary sketches were proposed, and some basic shapes were passed to the engineering team to develop the steel frame.

Integrating the development process

To save time and avoid errors, we knew we had to integrate the development process. The project designs had to be updated at each step to integrate the experience of skilled prototypers, metalworkers, and coach builders with the sophisticated computer tools we were using for modeling and analysis.

Rhino's easy file exchange key to the project's success

As it turned out, it was **Rhino's ability to share 3-D models among applications** that let the designers and engineers share models, parts, and data. This allowed for quick and accurate translation of the conceptual ideas into engineering, detailing, analysis, manufacturing, and marketing information.

Concept development

Since we were in a rush, I had to make some quick decisions and let the engineers go with the frame design. I soon found myself with some very rigid constraints. For example, we didn't have time for a new windshield mold, so we had to design everything around the dimensions of an available windshield.

I had played with some early designs on **Rhino** as it's very quick and easy for manipulating surfaces. I was a little skeptical about the quality of **Rhino** surfaces, so I planned to use I-DEAS for modeling most of the surface skin.

In I-DEAS, I modeled parametric solids that perfectly matched the underlying frame. I sketched and verified curves on cross sections that crossed the cabin at different levels, then lofted and swept some surfaces (all under parametric control). Finally, I cut the final shape out of the solid.

It was at that point that I switched back to **Rhino**, because it was unnecessarily complicated and time consuming to add cuts and details to the skin in I-DEAS. I exported the whole model including the frame, wheels, seats to **Rhino** via IGES without any problem.

The Project

Europa, a new line of mid-sized buses designed for tour operators on the tight roads in the mountains of the Italian Riviera.

The Designer

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The Company

Carrozziera SORA srl., Osoppo, Italy, a small highly qualified Italian coach builder who also specializes in customizing vehicles for disabled people.

The Team

The internal team included the project director, a CAD operator, and a couple of assistants in charge of purchasing and planning.

The external team included an industrial designer (**Paolo Velcich**), an engineering team, and a prototyping shop.

The Software

Rhino for conceptual design, surfacing, detailing, and model translation.

I-DEAS for mechanical design.

ADAMS for simulation.

AlphaCam for CAM.

The Hardware

Modeling was performed on various ordinary Pentium/NT machines, ranging from 200 Pro to PII/300, nothing special.

SGI workstations were used mainly for analysis and simulation.

For more information visit

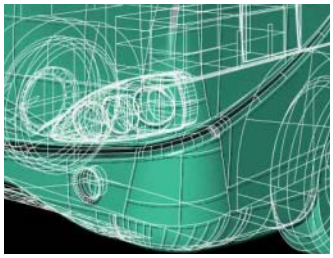
www.rhino3d.com

Working in **Rhino**, I first removed all the unnecessary curves and points. Then I joined the surfaces together and divided them by layer to keep the work as clean as possible.

I soon discovered **Rhino** is really exceptional for quick but accurate conceptual work. The interface and its user friendliness are really important and make the difference when you're in a hurry. I think ***I'm able to "sketch" ideas in Rhino almost as fast as I can on paper***.

Details added

During the development of some parts of the coach, especially the front and details on the back, I had to test several different air vents, light housings, bumper curvatures, and other small but important details.



Rhino let me place hand drawings/sketches as bitmaps in the viewports and scale them to fit the model. I used my design sketches and the scanned images from the real front lights to design curves that I used to cut holes, trim surfaces, and make window openings.

Rhino is a great tool when you need to sketch on surfaces and add details, holes, and bends. You can project curves on surfaces, draw normal to surfaces, blend between surfaces, split, trim, and stretch. You can do almost everything, and you do it intuitively, easily, and quickly.

Rhino was surprisingly fast even with very large models on an ordinary PC.

At the end of this task I was very happy to see that I was able to re-import the model to I-DEAS keeping the surfaces consistent and watertight. When you transfer models via IGES, you lose the parametric properties, but I-DEAS accepted the surfaces I modeled in **Rhino** and was able to work on them.

Simulation studies

The detailed **Rhino** model was essential for the interior design process, where advanced composites techniques were used for cabinets and other parts. Virtual mannequins were also used for human factors in the interior design process. The same model was also used in advanced simulation for the noise reduction.

CNC milling

IGES exchange of 3-D data allowed for successful interfacing with CNC tooling. I had to do some undercuts on the rear light housing that turned out to be much easier in **Rhino**. Then I was able to export the

model both to I-DEAS and to the CNC machine. We tested the **Rhino** model on both Mastercam and AlphaCam and actually manufactured on a five-axis CNC milling machine via AlphaCam.

Show Time

The first bus was finished just in time for the annual trade show in Verona. But it wasn't finished early enough to take photographs and have literature printed for the show.

The 3-D models helped again. All the pictures for the communication and promotion were produced using raytraced photorealistic renderings of the **Rhino** models.

Next

Thanks to the 3-D models and the great tools, we were able to finish the next Europa design only a few weeks after the first one was released.

Used again and again

Since SORA specializes in customization, we'll be using the **Rhino** models and the detailed library of accessories again and again, to provide better and faster service to SORA's customers.

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